REVIEW OF METHOD USED BY NMFS TO CALCULATE "BOR-CAUSED NON-ATTAINMENT" PERCENTAGES FOR MEETING FISH FLOW OBJECTIVES AT LOWER GRANITE DAM IN TABLE 6.2-2 OF THE JULY 27, 2000 DRAFT NMFS BIOP

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Table 6.2-2 in the July 27, 2000, NMFS' draft biological opinion presents the "BOR-caused Non-attainment" for meeting fish flow objectives at Lower Granite Dam. This table attempts to identify the percent of years that flow objectives are not met at Lower Granite as a result of U.S. Bureau of Reclamation actions. I have spoken with Bureau and NMFS personnel in order to determine how these values were derived. In general, the procedure was as follows:

(a) The Bureau calculated the total irrigated area and the area irrigated by Bureau "projects" in the Snake River Basin above Lower Granite Dam. These acreage values were multiplied by monthly consumptive use estimates to arrive at monthly depletions for both the entire irrigated area and Bureau "projects." This information was then relied upon by NMFS.

(b) NMFS calculated the impact of all irrigation on Lower Granite flows by subtracting what is labeled as "current flows" (the 1995 BiOp Study STD70e) in the Cumulative Effects Study from what is labeled as "Case 3 - Diversions removed" in the Cumulative Effects Study. Both studies consisted of monthly flows using the water supply conditions from 1929 through 1978.

(c) NMFS then applied the ratio of "project" to total depletion derived by the Bureau in step (a) to the April through August flow differences from step (b). This represented NMFS' estimate of the flow reduction at Lower Granite caused by the Bureau.

(d) NMFS then added the values from step (c) to the 1999 BiOp Study 00FSH26 to estimate what the flow at Lower Granite would be without Bureau actions. This produced the "without BOR depletions" values in Table 6.2-2.

(e) Finally, NMFS calculated the percent of time that the flow objectives were met at Lower Granite on a monthly basis for the flows from step (d) and Study 00FSH26. The increase in frequency of meeting target flows in the "without BOR depletions" values in step (d), as compared to Study 00FSH26, produced the "BOR caused non-attainment" values in Table 6.2-2.

Bureau "Project" Depletion vs. Total Depletion

Procedure: The Bureau used U.S. Geological Study aerial coverages to obtain total irrigated acres, both Bureau and private, as 3,907,000 acres. The Bureau then used 1992 Bureau project summaries to derive irrigated acres attributable to Bureau "projects" as 1,591,000 acres. To do so, the Bureau summed all projects which own space in any Bureau reservoir, regardless of whether storage water or natural flow is the primary supply of water for the "project" lands. The Bureau then multiplied these acres times monthly estimates of consumptive use. NMFS then used the ratio of these values (Bureau "project" consumptive use to total consumptive use), or about 0.41, to estimate the Bureau-caused portion of flow depletion at Lower Granite.

Comments: Using a ratio of Bureau to total depletion to assess the impact of Bureau actions is an extreme oversimplification. Many other factors should be taken into consideration such as reservoir fill and release operations, return flow patterns, and distribution between surface and ground water sources, as well as the relative magnitude of private natural flow diverted. Even if one accepts this method, the acres used by the Bureau and NMFS attributable to Bureau projects should be adjusted for private development that has occurred independent from Bureau projects. The Bureau refers to these lands which have Bureau-developed storage as "supplemental" as opposed to those lands which were developed in direct response to storage reservoirs, which are called "full service."

Because the Bureau multiplied both the total and Bureau "project" acres by the identical consumptive use factors, the depletion ratio that NMFS derived is exactly the same as the ratio of Bureau "project" acres to total acres: 0.41. Therefore, the following discussion will focus on the Bureau estimate of Bureau "project" acres rather than on depletion.

In determining the total acreage of Bureau projects, the Bureau included 100 percent of the acreage of entire projects that hold contracts for space in Bureau reservoirs, regardless of the magnitude and frequency of use of that space. Many of the older privately-developed projects have contracted for small amounts of space in federal reservoirs for potential use in extreme drought conditions. Many of these projects rarely, if ever, use their storage and definitely should not be classified as Bureau projects. Other projects use this water source for only a small percent of their normal water supply, and therefore should not be counted as Bureau projects in their entirety. The Bureau's analysis significantly inflates the percent of depletion attributable to Bureau projects.

To assess the potential impact of this overestimation of Bureau project influence, the table below presents a more reasonable approach. This table uses the same 1992 acreage values as the Bureau used in their analysis. However, all project acreage values for supplemental lands (not having storage as there primary water supply) are factored down by considering the amount of storage actually used per acre, as compared with the amount of storage actually used per acre of full service lands in the same basin.

For example, in 1992, full service lands in the Boise basin used 2.18 acre feet of storage water per acre, while supplemental lands used 0.66 acre feet of storage water per acre. For full

service lands, storage water represented about 65% of their total supply as compared to about 15% for supplemental lands. Obviously, the full service lands would not exist were it not for the Bureau project, but the supplemental lands would exist and in fact did exist long before Bureau projects were developed. Therefore, a more reasonable procedure is to factor down the supplemental acreage proportional to the ratio of storage use. In the case of the Boise, supplemental lands were multiplied by 0.66/2.18, or 0.30. This resulted in a "Bureau acres equivalent" of 29,600 acres, as compared to the Bureau estimate of 98,637 acres. Using this approach for the Upper Snake, Payette, and miscellaneous Snake River basin lands, a total Bureau acres equivalent of about 1,098,700 acres was derived, resulting in a ratio of Bureau to total lands of 0.28, as compared to the Bureau estimate of 0.41. **Therefore, assuming acreage is a valid indicator of Bureau effects, by using an inflated ratio of Bureau to total acres, the Bureau/NMFS analysis has overestimated the "Bureau-caused" depletion at Lower Granite by as much as 46 percent.**

Using the same procedure that the Bureau and NMFS used to compute the percent "BOR-caused non-attainment" in Table 6.6-2, together with more appropriate estimates of Bureau acreage, the April percent non-attainment would be reduced from 4% to 2%, May from 10% to 2%, June from 14% to 12%, July from 18% to 8%, and August from 8% to 4%. The following table summarizes these monthly values. Further weaknesses in using the cumulative effects study "case 3" as a measure of "without BOR" flows are discussed below.

Month	**Bureau Non-Attainment using Case 3 0.41 Acreage Factor**	**Bureau Non-Attainment using Case 3 0.28 Acreage Factor**
April	4%	2%
May	10%	2%
June	14%	12%
July	18%	8%
August	8%	4%

NMFS' Use of the "Case 3 – Diversions Removed" Analysis from the Cumulative Effects Study

Procedure: NMFS used the Bureau Cumulative Effects Study to determine the "irrigation-caused" flow reductions at Lower Granite. To do this, NMFS calculated the difference between the "current flows" (from the 1995 BiOp Study STD70e) at Lower Granite and the "flows with diversions removed – (Case 3)" study. The "Case 3" study removed all diversions and return flows and operated the existing reservoir system exclusively for flood control, power, and to meet the BiOp's flow objectives at Lower Granite. Case 3 obviously produced much greater flows at Lower Granite than currently exist. NMFS then multiplied this increase in flow by the 0.41 ratio of Bureau to total depletion (acres). This became the Bureau-caused flow depletion at Lower Granite.

Comments: In using the Case 3 study, NMFS has reasoned that Bureau-caused depletions should be measured against a scenario where diversions are terminated at Bureau projects, and reservoirs are instead operated to meet fish flow objectives. Using this approach, together with the over-simplification of using an acreage ratio, creates several extreme weaknesses in the analysis. If all reservoir storage were taken away from private and federal lands, diversion and cropping patterns would change drastically as early-season natural flow rights would be exercised to their maximum. Prior to the construction of storage facilities, early-season diversions were significantly greater as irrigators captured spring runoff, especially in years of low runoff when late-season flows were anticipated to be low.

A true "without Bureau" flow scenario would be a study of the Snake River depicting flows resulting from the most likely private irrigation of lands by relying solely on natural flow (no-storage) rights. NMFS' method gives no credit for actual flow increases during critical fish migration periods that have occurred as a direct result from Bureau operations such as reservoir releases which offset diversions and increases in return flows. Bureau calculations provided to NMFS show an actual average increase in flow at Lower Granite during July and August. To perform a "without Bureau" study would involve many difficult assumptions and, as the BiOp itself states, such a study would be speculative.